PERIMETER
AIR MONITORING PLAN
(REMEDIATION SERVICES, INC.)

APPENDIX C

PERIMETER AIR MONITORING PLAN

for

Response Actions

at

Class 2 Non-Hazardous Waste Landfill
Exide Technologies, Inc.
Frisco, Texas

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&

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1.0 INTRODUCTION

The purpose of the air monitoring and dust control plans are to identify the measures that will be taken to monitor and minimize emissions associated with remediation activities at Exide Technologies' Class 2 Landfill (Site). Specifically, this *Perimeter Air Monitoring Plan* outlines the requirements and methods for monitoring ambient air quality during planned slag excavation and treatment activities for particulate matter (dust), lead and cadmium. This plan works in conjunction with the *Dust Control Plan,* which describes operational controls to reduce dust emissions during slag excavation and treatment activities.

As described in the *Response Action Work Plan*, the objective of the proposed response action is to remove discrete areas of waste containing concentrations of lead and/or cadmium that exceed the Universal Treatment Standard (UTS), re-treat the excavated material until laboratory analysis indicates regulatory compliance (below the UTS), redeposit it in the cells, and collect confirmation samples of the in-place treated slag to ensure that excavation has removed all wastes that exceed the UTS and no land ban or hazardous wastes remain in the cells. Excavated material will be stockpiled and re-treated within the boundaries of the active landfill. Approximately 4,000 cubic yards of lead and cadmium-impacted slag will be excavated and re-treated on-site. If, based upon sampling results, additional materials require treatment, such materials will be treated in the same manner as the initial quantities of slag. Air quality monitoring will consist of exposure monitoring by NIOSH Method 7300 for on-site workers[1] and ambient air monitoring to measure off-property impacts. Air quality will be monitored by Remediation Services, Inc. (RSI).

The primary objectives of the perimeter air monitoring are to:

- Develop a relationship between particulate (dust) levels and concentrations of lead and cadmium, so that the particulate measurements can be used as a surrogate;
- Determine if concentrations of lead and cadmium and particulate emissions are in excess of air Take Action or Stop Work Levels established for the Site; and
- Ensure that engineering controls and work practices help minimize potential off-site impacts. The monitoring plan will help ensure that RSI reacts quickly and makes appropriate changes to dust control measures as needed.

Air quality will be measured and documented at air quality monitoring stations during excavation and treatment activities in accordance with this plan.

2.0 ORGANIZATION OF PLAN

This plan addresses continuous perimeter monitoring for particulates (PM_{10}), explains how the relationship between particulate, lead, and cadmium will be established and describes how the "Take Action" and "Stop Work" Levels will be identified and implemented for particulates. In addition, the plan describes how samples will be collected to directly measure lead and cadmium and how that data will be used.

3.0 PARTICULATE MONITORING

3.1 Equipment

Real-time particulate air monitors (e.g., E-BAM Particulate Monitor or equivalent) equipped with an omni-directional air intake device and a "PM_{10}" impactor head will be used at the Site to monitor dust levels at or near the property boundaries during remediation activities that could generate dust. Attachment 1 provides specific information regarding the E-BAM Particulate Monitors that will be utilized at the Site.

[1] Worker exposure monitoring is described in detail in the *Health and Safety Plan*.

3.2 Monitoring Locations

One upwind and three downwind monitoring locations will be established each day and monitors placed at or near the property line for each location to ensure adequate coverage to minimize the potential for off-site impacts. RSI will utilize National Weather Service forecasts and review current conditions and recent trends from an onsite meteorological station to position the monitors each morning prior to start of work. Monitor locational information will be determined by GPS and recorded. Wind speed and direction will be recorded and the data sent to onsite personnel as described in Section 3.6. If there is a 180 degree change in the prevailing wind direction during the work day, the downwind monitors will be appropriately relocated and waste disturbing work will be suspended until the monitors resume operation.

3.3 Take Action and Stop Work Levels Using Particulates as a Surrogate for Lead and Cadmium

The 2008 National Ambient Air Quality Standards (NAAQS) standard for lead has been utilized to establish Take Action and Stop Work Levels for real-time particulate monitoring based on lead (AL^{Pb}) that will help minimize off-site property impacts associated with Site remediation activities. Take Action and Stop Work Levels for real-time particulate monitoring based on cadmium (AL^{Cd}) will also be established. The lead and cadmium levels will be calculated based upon correlations derived from project monitoring data and the more stringent of the two used to establish the ongoing Take Action and Stop Work Levels for PM_{10} (AL^{PM}).

3.3.1 Establishing Particulate Take Action and Stop Action Levels for Lead

The target level for lead on a one-hour basis, TPb, has been derived from the current (2008) NAAQS for Pb, 0.15 µg/m^3, which is expressed as three-month rolling average. The AL^{Pb} derived from the NAAQS will be implemented on the basis of 30-minute and 60-minute block-averaged particulate readings. The particulate Take Action Level notification will be based on a 30-minute downwind block average. The particulate Stop Work Level will be set on 30-minute and 60-minute downwind block averages.

According to Appendix D, “Averaging Period Concentration Estimates” in EPA-454/R-92-024 “Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised)” December 1992, the appropriate multiplying factor in converting one-hour averaged concentrations to three-month averages is 0.1. Therefore, to set an equivalent one-hour allowable concentration consistent with the three-month averaged Pb NAAQS, the NAAQS value of 0.15 µg/m^3 is divided by 0.1, yielding 1.5 µg/m^3 = 0.0015 mg/m^3 Pb = TPb.

The AL^{Pb} will be calculated by the following method:

The lead content fraction (FPb), taking into account downwind sampling stations, will be determined from project-collected particulate and lead concentration data based upon the following relationship in the measured downwind monitor data. Any sample results for lead which are reported from the laboratory as being below the detection limits will be entered into this calculation as ½ of the reported detection limit rather than as zero. The calculation of FPb will be completed for the averaged data from each of the three downwind particulate matter and sampler pairs.

$$\frac{\text{mg Pb/m}^3}{\text{mg Dust/m}^3} = \text{FPb}$$

The highest of the calculated values from the three downwind monitor and sampler pairs will be the FPb. The AL^{Pb} for the dust monitors for the action levels described above will be then be calculated as follows:

$$\frac{(TPb)\ (mg/m^3)}{FPb} = AL^{Pb}\ mg/m^3$$

3.3.2 Establishing Particulate Take Action and Stop Work Levels for Cadmium

The Texas Commission on Environmental Quality (TCEQ) short-term Effects Screening Level (ESL) for cadmium is 0.0001 mg/m^3. In order to derive a comparable PM_{10} Take Action Level, the AL for cadmium based upon the content of cadmium in the measured dust (FCd) is determined from the downwind project-collected particulate and cadmium concentration data by the following equations. Any sample results for cadmium which are reported from the laboratory as being below the detection limits will be entered into this calculation as ½ of the reported detection limit rather than as zero. The calculation of FCd will be completed for the averaged data from each of the three downwind particulate matter and sampler pairs.

$$\frac{mg\ Cd/m^3}{mg\ Dust/m^3} = FCd$$

The highest of the calculated values from the three downwind monitor and sampler pairs will be the FCd. The AL^{Cd} for the dust monitors for the action levels described above will be then be calculated as follows:

$$\frac{(ESL\ Cd\ 0.0001)\ mg/m^3}{FCd} = AL^{Cd}\ mg/m^3$$

3.3.3 Take Action and Stop Work Levels for PM_{10} as Surrogate

The 30-minute block average Take Action Level and 60-minute block average Stop Action Level for PM_{10} are referred to as the AL^{PM}. The AL^{PM} will be the LOWER of the calculated AL^{Pb} and AL^{Cd}. The 30-minute block average Stop Action Level will be two times the AL^{PM}. In no event will the AL^{PM} be greater than 0.15 mg/m^3.

During the pilot study work described in Section 6, AL^{PM} will be 0.1 mg/m^3 a level more conservative than the NAAQS for PM_{10} (0.15 mg/m^3). Site-specific data regarding the relationship between PM10, Pb, and Cd concentrations in the air related to this remediation project will be used after the results of the initial pilot test have been verified to set the AL^{PM} and to update the AL^{PM} at least every two weeks thereafter based upon the site-specific measured relationships. Extenuating circumstances may be addressed by changes to, or accommodations within, this plan made in consultation with and upon approval of the TCEQ Executive Director.

3.4 Stop Work Level for Wind

A wind speed Stop Work Level notification will be set on a one-minute block average using data from the on-site meteorological station. If the sustained wind speed (the wind speed obtained by averaging the measured values over a one minute period) exceeds 20 miles per hour, all waste-disturbing activities must cease until the sustained wind speed declines to 20 miles per hour or lower for at least 15 consecutive minutes. Non-dust producing activities (equipment maintenance, etc.) may still be conducted during these periods.

3.5 Particulate Monitors and Wind Speed Data Monitoring and Notifications

3.5.1 Particulate Monitors

The particulate monitors will be monitored at a remote location by Field Data Solutions (FDS). FDS hosts and manages a computer based monitoring system which will provide Take Action and Stop Work Level notifications to both field and management personnel on a real time basis as well as provide real time access to values from each instrument. Each of the E-BAM monitors will be equipped with a wireless modem. A cellular communication gateway will be installed at the site to act as a central communications hub.

3.5.2 Wind Speed Data Monitoring

The onsite weather system, used to monitor wind speed and direction will be equipped with a wireless modem or access will be obtained over the internet from the existing onsite weather station. This system will be integrated with the FDS data system to provide Stop Work Level notifications to both field and management personnel on a real time basis as well as provide real time access to the current wind speed and direction.

3.5.3 Notifications

Notifications of particulate or wind speed Take Action or Stop Work Levels will be sent via text message or SMS to field personnel. Notifications to the field office will be sent via email. The notifications will be sent to RSI's site onsite Project Manager, Dust Control Technician, and the W&M Onsite Oversight Person. The notifications will be sent as a Take Action Level notification or a Stop Work Level notification. The Dust Control Technician will be the primary individual responsible for monitoring the notifications and ordering implementation of response actions. However, all of these individuals will have the authority to order implementation of the response actions, if needed.

3.5.4 Stop Work Criteria for Monitors

If the signal from either the downwind particulate monitors or the onsite weather system are lost for five minutes or more, all waste-disturbing activities will be suspended until the downwind particulate monitors and the onsite weather system are operational and the signal to the Field Data Solutions system is re-established.

3.6 Dust Suppression Measures

3.6.1 Particulate Take Action Levels

If the 30-minute average PM_{10} concentration exceeds the Take Action Levels presented in Table 1, the Contractor will immediately implement increased dust suppression activities. These increased dust suppression adjustment activities may include, but are not limited to the following:

- Increased wetting/misting of work area
- Adding surfactant to the water used for dust control
- Applying temporary cover (paper mulch with tackifier) to areas not being actively worked
- Adjusting the rate/speed and/or quantity of equipment in the work area
- Covering active stockpiles with plastic sheeting or tarps

3.6.2 Particulate Stop Work Levels

If the one-hour (60-minute) average or thirty-minute (30-minute) average PM_{10} concentration exceeds the applicable Stop Work Level presented in Table 1, the Contractor will immediately stop all waste-disturbing work. During the work stoppage period (minimum 15 minutes), the Contractor must make dust suppression adjustments to reduce airborne particulate matter concentrations below the Take Action Level concentration for particulate. The dust suppression adjustment activities may include, but are not limited to the following:

- Increased wetting/misting of demolition area
- Adding surfactant to the water used for dust control
- Applying temporary cover (paper mulch with tackifier) to areas not being actively worked
- Adjusting the rate/speed and/or quantity of equipment in the work area
- Covering active stockpiles with plastic sheeting or tarps
- Stopping specific dust-generating activities until wind directions and/or wind speeds are more conducive to reduced dust levels
- Mobilize additional dust suppression equipment and initiate its use

After the Contractor dust suppression adjustments have been implemented (minimum 15-minute period), the Contractor may resume work. During the first 30 minutes after resumption of work activities, the air monitoring technician will continuously monitor the dust levels utilizing the real time data sent to the onsite computer to ensure the dust suppression adjustments are effective. Adjustments to dust suppression activities will be made if needed. If particulate concentration Stop Work Levels are exceeded twice in one work day, the Contractor must immediately stop work for the remainder of that work day and design and implement a more effective dust control program prior to resuming work the following work day. During this period, the contractor may perform equipment maintenance and other non dust-producing activities.

4.0 PERIMETER AIR SAMPLES COLLECTED FOR LABORATORY ANALYSES

4.1 Metals Analyses

Air samples will be collected upwind and downwind at the property boundaries (at the same location as the E-BAM monitors) for laboratory analyses of both lead and cadmium during waste-disturbing activities using a low volume particulate sampler. This analytical data will be correlated with the real-time particulate concentration data collected by the E-BAM monitors at least every two weeks. The lowest correlated particulate Take Action Level for cadmium and lead will be utilized for the dust monitors, AL^{PM}.

Air samples for these metals analyses will be collected by the Contractor at least three times weekly (every other day) during active waste disturbing activities. Samples will not be collected on days when waste disturbing activities are not occurring. If milling and waste treatment activities occur during a given week, that week's sampling will include each activity. For example, if milling occurs during only two days of a six day period, one of the samples collected will be during that two day period.

Air samples for metals analyses will be collected over a full working shift (typically eight – ten hours) using a Model Gilian Model GilAir5 air sampling pump, or equal. The air sampling interval may be less than eight hours in the event of inclement weather during the air sampling period (such as severe thunderstorms). Air samples will be collected by attaching laboratory-provided air sample filter cartridges (0.8- micrometer mixed cellulose ester membrane filter cartridge) to the pump, and setting the air sample filter cartridges approximately five feet above ground level at the E-BAM monitor locations, which are at or near the property lines both upwind and downwind. When the samplers are relocated with the E-BAM monitors due to a 180 degree change in the prevailing winds, the samplers will be shut off during the relocation and started in the new location without a filter change. The air sample pumps will be set at a flow rate of approximately two to three liters per minute, thereby resulting in an air sample volume of approximately 1200 liters per air sample.

Following air sample collection, the air sample cartridges/tubes will be securely capped, labeled, and delivered with chain of custody documentation to an independent analytical laboratory (TBD) for metals (i.e. both lead and cadmium) analyses. Laboratory analyses on an expedited 24-hour turnaround will be requested. Metals will be analyzed using NIOSH Method 7303. Test method details are provided in Attachment 2.

Laboratory data will be validated by Exide's consultants and provided to the TCEQ within two business days of receipt of validated analytical results, excluding the day that the results are received. If data is received that cannot be validated, an email notification will be provided to the TCEQ within two business days with a brief description of the issue(s). Upon receipt of the corrected data from the laboratory, Exide's consultant will validate and provide to TCEQ as described above.

4.2 Metals Concentrations Take Action Levels

Following receipt of the lead and cadmium analytical laboratory reports, the analytical data will be compared to the lead and cadmium Take Action Levels shown on Table 1 (revised as appropriate based on sample results). If either concentration in the downwind samples exceeds the relevant Take Action Level, the Contractor will immediately implement increased dust suppression activities. These increased dust suppression adjustment activities may include, but are not limited to the following:

- Increased wetting/misting of work area
- Adding surfactant to the water used for dust control
- Applying temporary cover (paper mulch with tackifier) to areas not being actively worked
- Adjusting the rate/speed and/or quantity of equipment in the work area
- Covering active stockpiles with plastic sheeting or tarps
- Mobilizing additional dust suppression equipment and initiating its use

4.3 Metals Concentrations Stop Work Levels

Following receipt of the lead and cadmium analytical laboratory reports, the analytical data will be compared to the Stop Work Levels shown on Table 1. The Stop Work Level for lead has been derived from the current (2008) NAAQS for Pb, adjusted as appropriate to address the differences in averaging periods. According to Appendix D "Averaging Period Concentration Estimates" in EPA-454/R-92-024 "Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised)" December 1992, the appropriate multiplying factor in converting eight-hour averaged concentrations to three-month averages is 0.14. Accordingly, the NAAQS value of 0.15 $\mu g/m^3$ is divided by 0.14, yielding 1.05 $\mu g/m^3$ average concentration as the lead Stop Work Level. For cadmium, the TCEQ short term ESL of 0.1 $\mu g/m^3$ average concentration is the Stop Work Level. The Take Action Levels for the lead and cadmium sample results are set at 75% of the Stop Work Levels.

If the Lead or Cadmium Stop Work Levels are exceeded, the Contractor will immediately stop all waste disturbing activities and design and implement a more effective dust control program prior to resuming work. The additional dust suppression activities may include but are not limited to the following:

- Increased wetting/misting of work area
- Adding surfactant to the water used for dust control
- Applying temporary cover (paper mulch with tackifier) to areas not being actively worked
- Adjusting the rate/speed and/or quantity of equipment in the work area
- Covering active stockpiles with plastic sheeting or tarps
- Stopping specific dust-generating activities until wind directions and/or wind speeds are more conducive to reduced dust levels
- Mobilizing additional dust control equipment

Table 1 provides, in chart form, the initial action levels and responses for particulates, lead and cadmium. Table 1 will be updated based upon the relationship of dust and lead concentrations utilizing the formulas in Section 3.3.1 and based upon the dust and cadmium concentrations utilizing the formulas in Section 3.3.2 once the initial pilot waste treatment in Section 6 has been completed and at least every two weeks thereafter based upon the relationship between dust and metals levels measured.

TABLE 1

Initial Action Levels and Response

Contaminant of Concern	Monitoring Method	Frequency of Monitoring	Take Action Level to Increase Dust Suppression / Emission Controls	Stop Work Level
Particulate Matter	Visual		Visible dust within the active Work Zone – Implement additional dust control measures.	Dust leaving the Work Zone perimeter – Stop Work. Implement additional dust control measures.
	PM_{10} Particulate Monitors	30-minute block average	0.1 mg/m^3 30-minute concentration – Implement additional dust control measures.	0.2 mg/m^3 (or, subsequently, two times AL^{PM}) 30-minute concentration – Implement additional dust control measures.
	PM_{10} Particulate Monitors	60-minute block average		0.1 mg/m^3 hourly concentration – Stop Work. Implement additional dust control measures.
Lead	Low Volume Particulate Samplers	Three days per week	0.78 µg/m^3 – Implement additional dust control measures.	1.05 µg/m^3 average concentration.
Cadmium	Low Volume Particulate Samplers	Three days per week	0.075 µg/m^3 – Implement additional dust control measures.	0.1 µg/m^3 average concentration (TCEQ short term Cd ESL).

5.0 REPORTS

5.1 Daily Dust Concentration and Wind Speed and Direction Summary Reports

Daily Dust Concentration and Wind Speed and Direction summary reports will be prepared by FDS. These summary reports will include the average 30-minute net block average results for each E-BAM instrument and the 30-minute block average wind speed and direction data. Take Action or Stop Work level exceedances and the dust suppression adjustment activities implemented in response will be documented in the summary reports.

Summary reports must be completed within two business days of the monitoring day being reported. The data will be validated by Exide's consultants. Summary reports of the validated data will be provided to the TCEQ within two business days of receipt of verifiable results, excluding the day that the results are received. If data is received that is not able to be validated, an email notification will be provided to the TCEQ with a brief description of the issue(s). The summary report with the corrected data will be resubmitted to Exide's consultant followed by validation. The summary report with validated data will then be submitted to TCEQ as described above.

6.0 PILOT STUDY – WASTE TREATMENT AND WASTE MILLING

Prior to commencing full scale excavation and waste treatment activities, a pilot study will be performed over a three-day initial period using the same means and methods to be utilized during full scale excavation and treatment. In addition, a second pilot study will be performed over a three day period prior to commencing full scale milling activities. The primary objective of each pilot study is to develop the relationship between particulate (dust) levels and the lead and cadmium metal fractions in the particulate. Particulate measurements can then serve as a surrogate for the lead and cadmium concentrations in the air. TCEQ will be notified at least two business days before each pilot test commences.

During the pilot studies' work activities, both the upwind and downwind particulate air samplers and the full shift air samplers for metals will be operated. When the laboratory results have been received and the relationship between the air samples for lead and cadmium in air and the real time particulate air monitors for the excavation and waste treatment or milling activities has been established, this data will be submitted to the TCEQ. Within two business days after such submission, TCEQ will inform Exide if Exide cannot commence full scale waste excavation and treatment or milling due to off-site air quality concerns arising from the pilot study's results that are not sufficiently addressed by the current project design.

7.0 QUALITY ASSURANCE / QUALITY CONTROL

Quality assurance (QA) refers to the planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy a given requirement for quality. QA is applied to location and equipment selection, equipment acquisition and installation, routine site operation, and data processing and reporting.

Quality control (QC) refers to the operational techniques and activities that are used to fulfill requirements for quality. QC procedures applied at each step provide checks for acceptable conditions with corrective procedures specified when necessary.

The purpose of QC procedures is to assess and document data quality and to define remedial corrective actions when operating conditions exceed pre-established limits. Routine QC procedures are designed to focus on areas most likely to have problems, based on experience and guideline documents. Table 2 shows the frequency of audits and routine QC measures for the air quality study. The following

Table 2 Schedule of Audits, Calibrations, and Quality Control Checks	
Frequency	**Activity**
Prior to Delivery, Prior to Start of Work, First Work Day of Each Week	Calibration of E-BAM Monitors
Weekly	Routine Checks of E-BAM Monitors (Tape, Clocks, Housekeeping) and Samplers
Every Two Weeks	Clean size selective inlets on E-BAM monitors and Samplers
Every Three Weeks	Flow Checks of E-BAM Monitors
At Least Monthly	Leak Check and Cleaning Nozzle and Vane of E-BAM Monitors
Weekly	Field Blanks Collected for Samplers
Monthly	Trip Blanks Collected for Samplers

7.1 Particulate Monitors

7.1.1 Quality Control

The E-BAM particulate monitor beta detectors are calibrated at the factory. The betadetector calibrations remain fixed for the life of the unit, and no user adjustments are required. Each unit has test membranes that are placed in the beta particle pathway to verify performance of the detector. The test membranes are thin sheets of material that absorb a fraction of beta particles equivalent to a known mass of particulate matter. Each instrument has an individually matched membrane, and the factory-provided equivalent mass reading is stored in the instrument. The reference membrane tests are performed automatically every hour by the E-BAM and will be manually performed prior to the start of the work (the manufacturer recommends a frequency of one or two times per year for the E-BAM). The units are also equipped with zero-check inserts that are used in the same manner as the reference membranes. The zero check insert test will be performed prior to the start of the work, and the first work day of each week.

QC flow checks will be made every three weeks to ensure that the correct sample flow rate is being maintained to provide proper particle size separation. The E-BAM particle size selective inlets are designed to function at a flow rate of 16.7 L/min to maintain proper particle separation. The flow checks of the E-BAM instruments will use a volumetric flow calibration kit (BGI deltaCal™). This calibrator includes flow, temperature and barometric pressure. As part of the flow check for the E-BAM, the reference temperature and barometric pressure readings will be compared to the corresponding readings produced by the E-BAM's internal sensors.

Periodic cleaning of the size selective inlets on the particulate monitors will be conducted every two weeks. The larger particles that are removed from the air flow are captured inside the PM_{10} inlet heads. To maintain proper operation of the inlets, the particle deposits must be cleaned periodically. A leak check will be performed at least once per month and prior to cleaning the nozzle and vane located beneath the filter tape. The nozzle and vane beneath the filter tape will be cleaned each time the tape is changed but at a minimum of once per month.

7.2 Low Flow Samplers

7.2.1 Quality Control

Field and trip blank quality control samples will be collected. Field blank samples assess the possible contamination introduced by field sampling procedures, sampling media, sampling equipment, or shipment of the samples. Trip blanks verify the cleanliness of the sampling media.

The field blank will be shipped to the field, prepared, and handled as the other samples, and returned to the laboratory, without drawing air through the sampler, for analysis. One field blank will be collected each week for metals analysis. The trip blank will be shipped to the field, left sealed in its packaging, and then returned to the laboratory for analysis. One trip blank will be analyzed per month.

7.2.2 Quality Assurance

Precision and accuracy checks are both elements of QA. Precision checks are a measure of agreement among individual measurements of the same parameter, usually under prescribed similar conditions. Accuracy is the degree of agreement between an accepted reference measurement and the field measurement. Accuracy may be expressed as a total difference, or as a percentage of the reference value, or as a ratio. Precision checks are performed as collocated measurements.

Accuracy of ambient air sampling equipment is measured in terms of the accuracy of the flow rate measurement. Accurate determination of the air volume drawn through the sampler is essential to the concentration calculation. Flow rates of the air samplers will be determined pre and post sampling using calibrated equipment appropriate to the sampling device.

Preventative maintenance will be part of the samplers' QA program. Preventive maintenance is a combination of preventive and remedial actions taken to prevent or correct failure of the monitoring systems. Preventive maintenance for the samplers includes inspection and cleaning of the inlets.

7.3 Laboratory Validation

Data validation is used to interpret the quality of the analytical data received from the laboratory. The quality of the data is determined through evaluation of both the field and laboratory quality control samples. Data validation procedures determine whether individual project data are useable, useable with qualification, or unusable. Data will be reviewed in accordance with guidelines presented in USEPA's *National Functional Guidelines for Inorganic Superfund Data Review* (2010) and/or *National Functional Guidelines for Organic Superfund Data Review* (2008).

The Laboratory will submit the analytical data and supporting quality assurance quality control data to Exide's consultant, W&M Environmental Group, Inc. for validation. The validation review will consist of a Level II review which includes the following: blank samples (i.e., trip, method, equipment, field, etc.) are reviewed for detections which may indicate whether field or laboratory handling may have cross-contaminated samples causing false positive or high-biased data; spike recovery samples (i.e., laboratory control sample, surrogate, or matrix spike) are reviewed to evaluate accuracy in the laboratory's ability to recover known concentrations that were intentionally spiked into the quality control samples; and, duplicate samples (field and/or laboratory-prepared) are evaluated to determine precision, which is the level of agreement among individual measurements. In addition to the above quality control samples, verification of appropriate analytical methods, reporting limits, sample preservation, and holding times are also reviewed to determine data usability.

Any potential bias (high or low) or cross-contamination observed as a result of the data review is usually addressed by addition of data qualifiers. These typically include one of the following: a non-detect (U) flag for blank detections resulting in potential cross-contamination; an estimated (J) flag for results that could be high or low biased due to accuracy or precision issues; rejection of data (R) due to results grossly outside their respective control limits or questionable data.

7.4 Dust Concentration, Wind Speed and Direction Report Validation

The Daily Dust Concentration and Wind Speed and Direction summary reports will be prepared by FDS. The summary reports will be reviewed by Exide's consultant, W&M Environmental Group, Inc. for validation. The review will include review of error reports, previous instrument flow and leak check information as well as review of the data received to insure the data being reported is from the instruments being used at the site,

7.5 Sample Information Management

The sample information management system for the study will be based on a uniform sample identification system. Each sample will receive a unique ID that is based on the unique combination of project, sampling date, sampling location and the Serial Number of the E-BAM Monitor that the sample is associated with.

The sample ID will be structured as follows:

EX-YYMMDD-LOC-XXX[-QQ], where

EX-LFWT	=	Project (Exide-Landfill Waste Treatment)
YYMMDD	=	Sampling date (e.g., 11/01/2012 = 121101)
LOC	=	Sample Location (e.g. UW = Upwind, DW = Downwind)
XXX	=	E-BAM Monitor Sample Association – Last 3 digits of Serial Number,
QQ	=	Optional QA sample flag (TB = trip blank, FB = field blank, SC = duplicate)

For example, a sample collected at a downwind station on 1 November 2012 would be identified as EX LFWT 121101 DW 123.

ATTACHMENTS

ATTACHMENT 1

E-Bam Particulate Monitors

E-BAM is a complete measurement system it comes with the following standard components:

- 8 Channel Datalogger
- Internal DC Vacuum Pump Standard
- Real-Time Concentration
- PM10 Inlet
- Aluminum Tripod
- Ambient Temperature Sensor
- Volumetric Flow Control
- Weatherproof Enclosure
- Filter Temperature Sensor
- Filter RH Sensor
- Filter Pressure Sensor
- Calibration Membrane

Specifications

Range	0 - 65 mg per cubic meter
Accuracy	2.5 µg or 10% in 24 hour period
Measurement Cycle	Hourly measurements with 1, 5, 10, 15, or 30 min real-time averages
Beta Source	C14, less than 75 microcurie, Half life of 5730 years
Detector:	Scintillation probe
Analog Output	0-1V, 0-2.5v, 0-5V, selectable hourly or real-time output
Filter Tape	Continuous glass fiber filter
Inlet	Compatible with EPA PM10 and PM2.5 inlets
Flow Rate:	16.7 liters per minute, adjustable
Flow accuracy	+/- 2% of reading, volumetric flow controlled
Sample Pump	Dual diaphragm type, DC powered, 4000 hr rating
Alarm Signals	Filter, flow, power and operation failure
Input Power	12 Volts DC @ 48 Watts max
Alarm Contact Closure	2 Amp @ 240 VAC max
Operating Temperature	-30 Deg C to 50 Deg C
Enclosure	41 cm x 36 cm x 20 cm, 13kg

Options and Accessories

- BX-302 Zero Calibration Kit
- BX-305 Leak check valve
- BX-307 Flow Calibrator
- BX-308 PM2.5 Sharp-Cut Cyclone
- BX-803 TSP Inlet
- EX-034 Wind speed and direction sensor
- EX-121 AC Power supply, 100-240 VAC, 12 VDC output
- EX-593 Ambient RH Sensor
- EX-996 Phone modem kit
- EX-911 Cell modem kit
- 460130 Filter tape, roll
- 9425 Wall mount bracket
- Airsis Satellite modem kit
- External AC Vacuum Pump
- MMP MicroMet Plus Software
- Solar Panel Array

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Rev. 08/09

E-BAM

The Met One E-BAM is a portable, real-time beta gauge which is comparable to U.S. EPA methods for $PM_{2.5}$ and PM_{10} particulate measurements.

The Met One E-BAM has been built to satisfy users, regulators and those from the health community by providing truly accurate, precise, real time measurement of fine particulate matter automatically. In addition, it is rugged, portable, battery operated, and deployable in 15 minutes.

The E-BAM offers the following advanced features:

1. Accuracy and precision consistent with U.S. EPA requirements for Class III $PM_{2.5}$ and PM_{10} measurement.
2. Real-time, accurate results without correction factors, regardless of season or geographic location.
3. True ambient sampling provides accurate measurement of semi-volatile nitrates and organic compounds.
4. Lightweight, rugged construction is easily mounted on a tripod in minutes.
5. All-weather construction allows for true ambient sampling.
6. Operates on AC or DC power. Battery and Solar options available upon request.

Met One Instruments, Inc.

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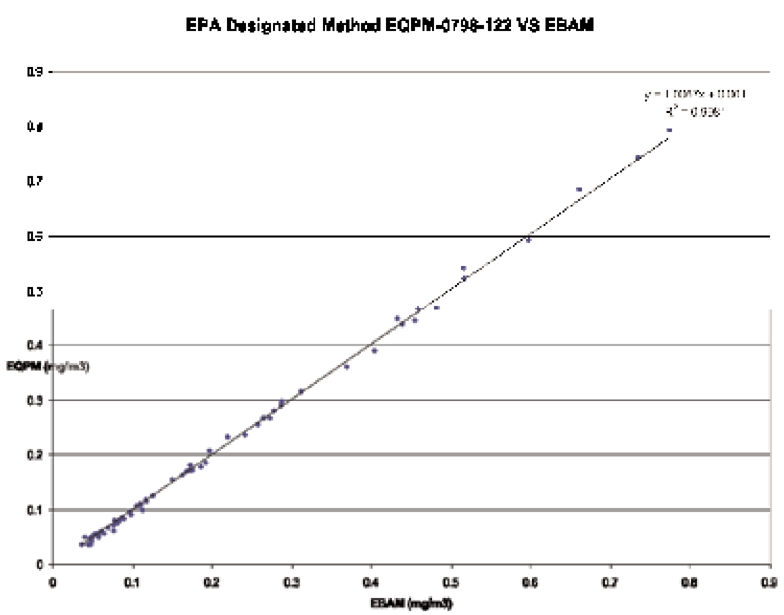
Continuous Monitoring

The E-BAM automates particulate measurement by continously sampling and reporting concentration data. Data records are updated every minute. E-BAM eliminates the old process of filter collection and manual filter weighing, and eliminates the need for more expensive, high maintenance instruments. Today, with the adaptation of Beta Attenuation to ambient monitoring this process became simple, streamlined, and inexpensive.

About Accuracy

Real-time accurate, reliable, and repeatable measurement of ambient fine particulate matter has been the elusive goal of environmental regulators and health professionals for many years. Met One Instruments has developed advanced particulate monitoring instrumentation which is reliable, and is easy to operate. It will also automatically report results in near real time, eliminating the need for high levels of human intervention.

Because sampling occurs under true ambient conditions semi-volatile organic compounds and nitrates are easily detected thereby avoiding under measurement.



Continuous Sampling

E-BAM is a lightweight portable instrument that operates directly in hostile environments without an exterior enclosure. E-BAM is a very robust portable sampler system that is easily installed in less than 15 minutes. No other sampler matches the portability and flexibility of the E-BAM.

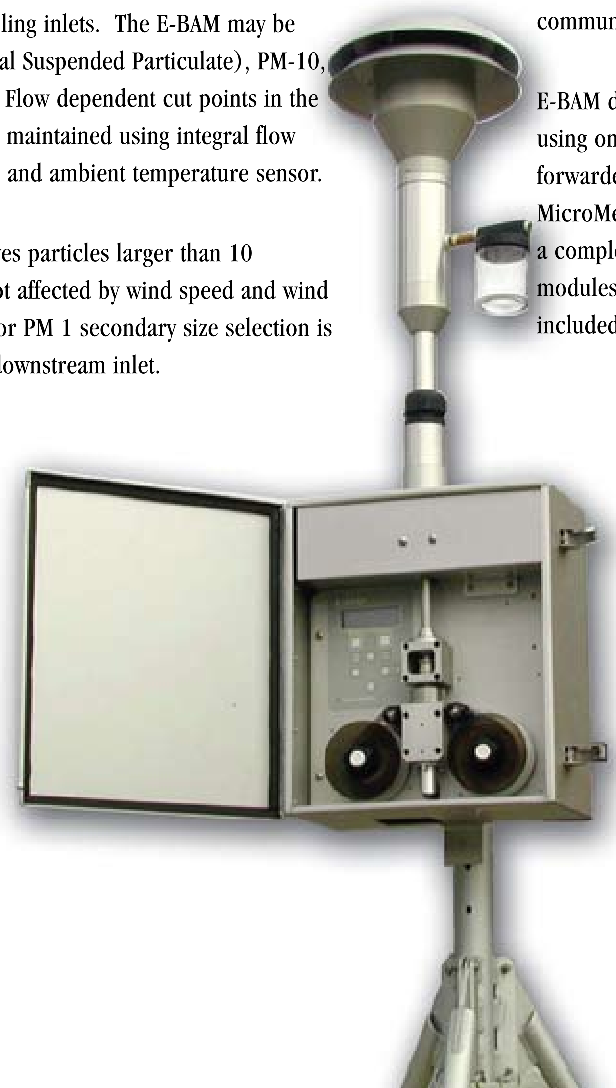
Set up

Quick setup of the E-BAM is assured with a series of prompts instructing the installer on the sequence to follow. Then the E-BAM performs a series of self test diagnostics and alerts the installer of any corrective action. Upon completion, the E-BAM automatically places itself in normal operate mode.

Particulate size selection

Size selective concentration measurements are made using a variety of sampling inlets. The E-BAM may be supplied with TSP (Total Suspended Particulate), PM-10, PM 2.5 or PM 1 inlets. Flow dependent cut points in the size selective inlets are maintained using integral flow meter, pressure sensor and ambient temperature sensor.

The PM-10 inlet removes particles larger than 10 microns, the inlet is not affected by wind speed and wind direction. For PM 2.5 or PM 1 secondary size selection is made using a second downstream inlet.



Construction etc.

The standard configuration of the E-BAM is a self-contained environmentally sealed aluminum enclosure placed on a rugged tripod. This system can be permanently placed on rooftops, near roads, at industrial sites, or rapidly deployed to monitor emergency situations.

'E- 'represents Environment Proof instrument, E-BAM has been specifically designed to work in hostile environments without additional protection.

Direct Field Reporting

Collecting real time or historical particulate data from a field site has never been easier. Advanced communication options include cellular phone, Line of Sight Radio, and for very remote sites, satellite communications are now available. E-BAM also supports the full line of standard MET ONE options, such as phone modem, and direct communications to a portable computer.

E-BAM data is recorded internally and may be retrieved using one of the communication options, or data may be forwarded to third party data acquisition system. MicroMet Plus Software supports the E-BAM and provides a complete communication, data base and reporting modules with charting. Comet data retrieved software is included.

Digital, Analog and Alarm Outputs

The E-BAM provides both continuous digital and analog outputs. Analog output is selectable to several full-scale voltages. Digital output is supplied as RS-232.

Reporting modes

The internal data logger can store up over 182 days of concentration data at one hour sample times, and collect data from eight other measurements at the same time! Both digital and analog outputs are included to enable users to connect to other data recording systems.

Easy to Operate

E-BAM has been programmed to operate at all times, except during calibration verification. Current data, historical data, and status information are available at all times without interrupting normal E-BAM operation.

Data Validation

The operator may select various criteria for data validation, including deviation from rolling average, high value excursions, power failure and others. If an error occurs it is entered into the error log with date, time and type of error.

ATTACHMENT 2

NIOSH Method 7303

ELEMENTS by ICP (Hot Block/HCl/HNO_3 Digestion) 7303

MW: Table 1 CAS: Table 2 RTECS: Table 2

METHOD: 7303, Issue 1 **EVALUATION: PARTIAL** **Issue 1: 15 March 2003**

OSHA: Table 2
NIOSH: Table 2
ACGIH: Table 2

PROPERTIES: Table 1

ELEMENTS:

aluminum	cadmium	indium	nickel	strontium	zinc
antimony*	calcium	iron	palladium	tellurium	
arsenic	chromium	lead*	phosphorus	thallium	
barium	cobalt	magnesium	platinum	tin*	
beryllium	copper	manganese	potassium	titanium	
bismuth*	gallium	molybdenum	selenium	vanadium	
boron	gold	neodymium	sodium	yttrium	

* With certain restrictions (see Table 3)

SAMPLING

SAMPLER: FILTER (0.8-µm, cellulose ester membrane)

FLOW RATE: 1 to 4 L/min

VOL-MIN: Table 1
-MAX: Table 1

SHIPMENT: Routine

SAMPLE STABILITY: Stable

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: 5,000 to 50,000 µg/sample

BIAS: Not determined

OVERALL PRECISION: Not determined

ACCURACY: Not determined

MEASUREMENT

TECHNIQUE: INDUCTIVELY COUPLED ARGON PLASMA, ATOMIC EMISSION SPECTROSCOPY

ANALYTE: See element list above

REAGENTS: Conc. HCl, 1.25 mL; and conc. HNO_3, 1.25 mL

FINAL SOLUTION: 5% HCl and 5% HNO_3, 25 mL

WAVELENGTH: Element and instrument specific

BACKGROUND CORRECTION: Spectral wavelength shift

CALIBRATION: Elements in 5% HCl, 5% HNO_3

RANGE: LOQ to 50,000 µg/sample [1]

ESTIMATED LOD: Varies with element; Table 1

PRECISION ($\hat{S}_r$): Not evaluated

APPLICABILITY: The working range of this method is up to 100 mg/m^3 for each element in a 500-L sample (the minimum range depends on the LOD for each sample; see Table 1). The analysis is not compound specific. Certain elemental compounds are known to be acceptable or unacceptable by this method (see Table 3). For unverified compounds, a test run should be conducted using a known amount of the compound in question to determine acceptability.

INTERFERENCES: Interferences are spectral in nature and are accounted for by choosing appropriate wavelengths, applying interelement correction factors, and background correction.

OTHER METHODS: Alternative, more sensitive methods exist for some elements by graphite furnace atomic absorption spectroscopy. This method is similar to NIOSH Method 7301, differing only in the use of the hot block for digestion of the sampler.

REAGENTS:

1. Hydrochloric acid,* conc., ultra pure.
2. Nitric acid,* conc., ultra pure.
3. Calibration stock solutions, 50-1000 µg/mL. Commercially available single element solutions or multielement solutions prepared as instructed by the instrument manufacturer.
4. Argon, prepurified.
5. Distilled, deionized, Type II water.
6. Diluting solution: 5% HCl : 5% HNO_3. To about 600 mL of deionized water in a 1-L volumetric flask, slowly add 50 mL conc. HCl and 50 mL conc. HNO3. Dilute to the mark with deionized water.

* See SPECIAL PRECAUTIONS

EQUIPMENT:

1. Sampler: cellulose ester membrane filter, 0.8-µm pore size, 37-mm diameter; in cassette filter holder.
2. Personal sampling pump, 1 to 4 L/min, with flexible connecting tubing.
3. Inductively coupled argon plasma-atomic emission spectrometer, equipped as specified by the manufacturer for analysis of elements of interest.
4. Hot block apparatus at 95 °C.
5. Digestion vessels and caps, 50-mL.
6. Watchglasses.
7. Pipettes, electronic and mechanical.
8. Regulator, two-stage, for argon.
9. Forceps.

SPECIAL PRECAUTIONS: Concentrated acids are powerful oxidizers, toxic, and corrosive liquids. Wear protective clothing and work in a fume hood.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Sample at an accurately known flow rate between 1 and 4 L/min for a total sample size of 200 to 2000 L for TWA measurements. Do not exceed a filter loading of approximately 2 mg total dust.

SAMPLE PREPARATION:

3. Open the cassette filter holder and with forceps remove the sample filter. Fold the filter into quarters taking care not to lose any sample, and transfer to a clean, 50-mL hot block digestion tube.
4. Add 1.25 mL HCl. Cover with a plastic watchglass. Place in the hot block and heat at an internal temperature of 95 °C for 15 minutes.
   NOTE: The internal temperature may vary from the digital readout. Calibrate the hot block prior to digestion.
5. Remove the sample from the hot block and cool for 5 minutes. Remove watchglass and add 1.25 mL HNO_3. Replace watchglass and return to hot block at 95 °C for 15 minutes.
6. Remove the sample from the hot block and cool for at least 5 minutes. Rinse watchglass into the sample container and discard watchglass.
7. Dilute to 25-mL final volume with distilled, deionized Type II water.

CALIBRATION AND QUALITY CONTROL:

8. Calibrate the spectrometer according to the manufacturer's recommendations. Use standards consisting of the same 5% HCl : 5% HNO_3 matrix as the samples.
9. Analyze a standard every 10 samples.
10. Analyze a media blank every 20 samples, and a reagent blank every 10 samples.
11. Analyze a set of two laboratory control samples every 40 samples of a given matrix for a given analyte.
12. Check recoveries with at least two spiked media blanks per ten samples.
    NOTE: In the determination of lead, there may be a measurement interference (for example, samples with high aluminum levels). More recent instruments have a correction for this.

MEASUREMENT:

13. Set spectrometer to conditions specified by manufacturer.
14. Analyze standards, samples and quality control checks.
    NOTE: If the elemental value for a sample is above the linear range of the element(s) in question, dilute the sample solution with 5% HCl : 5% HNO_3 diluting solution, reanalyze and apply the appropriate dilution factor in the calculations.

CALCULATIONS:

15. Obtain the solution concentrations for the sample, C_s (µg/mL), and the average media blank, C_b (µg/mL), from the instrument.
16. Using the solution volumes of sample, V_s (mL), and media blank, V_b (mL), calculate the concentration, C (mg/m^3), of each element in the air volume sampled, V (L):

$$C = \frac{C_s V_s - C_b V_b}{V}, mg/m^3$$

NOTE: µg/L ≡ mg/m^3

EVALUATION OF METHOD:

The method was evaluated for all elements and compounds listed in Table 1 and Table 2 between 1999 and 2001 using known amounts of bulk material [4]. Evaluation is ongoing for additional elements and compounds. The limits of detection and quantitation were also determined for each element. Two ICP instruments were used in the evaluation, a Thermal Jarrell Ash Model 61E [5] and a TJA IRIS [6], operated according to the manufacturer's instructions.

REFERENCES:

[1] WOHL [2001]. Metals validation using hot block digestion, Unpublished data. Wisconsin Occupational Health Laboratory, Madison, WI.
[2] NIOSH [1994]. Method 7300: Elements by ICP, NIOSH Manual of Analytical Methods, Fourth Edition, Issue 2, Aug. 15, 1994.
[3] WOHL [2001]. Metals Manual 2001, WOHL Internal Document, Updated Apr. 1, 2001. Wisconsin Occupational Health Laboratory, Madison, WI.
[4] WOHL [2001]. WOHL General Operations Procedures Manual, WOHL Internal Document, Updated 2001. Wisconsin Occupational Health Laboratory, Madison, WI.
[5] Thermal Jarrell Ash [1991]. ICAP 61E Plasma Spectrometer Operator's Manual, Thermal Jarrell Ash Corp., Part No. 128832-01, Feb., 1991.
[6] Thermal Jarrell Ash [1997]. IRIS Plasma Spectrometer User's Guide, Thermal Jarrell Ash Corp., Part No. 135811-0, Feb. 4, 1997.

METHOD WRITTEN BY:

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TABLE 1: ANALYTE INFORMATION FOR VALID ELEMENTS AND COMPOUNDS

Analyte	Properties MW	MP (°C)	LOD (µg/mL)	LOQ (µg/mL)	Estimated LOQ (µg/sample)*	Minimum** air vol. (L)	Maximum*** air vol. (L)
Al	26.98	660	0.111	0.37	9.25	2	10,000
As	74.92	817	0.009	0.03	0.075	8	5,000,000
Au	196.97	10.63	0.015	0.05	1.25	1	3,300
B	10.81	2177	0.0094	0.0283	0.71	1	3,300
Ba	137.34	3.51	0.0018	0.006	0.15	1	100,000
Be	9.01	2178	0.00075	0.0025	0.062	35	25,000,00
Bi	208.98	271	0.025	0.085	2.12	1	10,000
Ca	40.08	842	0.099	0.33	8.25	2	10,000
CaO	56.08	2927	0.139	0.462	11.6	3	10,000
Cd	112.4	321	0.0037	0.012	0.30	3	500,000
Co	58.93	1495	0.003	0.011	0.27	3	500,000
Cr	52.00	1890	0.009	0.03	0.75	8	500,000
Cu	63.54	1083	0.020	0.060	1.50	15	500,000
Fe	55.85	1535	0.070	0.20	5.00	1	5,000
Fe_2O_3 (as Fe)	159.69	1462	0.070	0.20	5.00	1	5,000
Ga	69.72	29.75	0.03	0.09	2.25	1	3,300
In	114.82	156.3	0.015	0.05	1.25	15	500,000
Mg	24.31	651	0.047	0.14	3.50	1	10,000
MgO	40.32	2825	0.078	0.23	5.75	5	33,000
Mn	54.94	1244	0.0012	0.004	0.10	0.05	10,000
Mo	95.94	651	0.0072	0.024	0.60	0.5	10,000
Nd	92.906	2477	0.01	0.03	0.75	0.1	3,300
Ni	58.71	1453	0.012	0.039	0.98	1	50,000
P	30.97	44	0.3	1.0	25	250	500,000
Pb	207.19	328	0.023	0.07	1.75	35	100,000
Pd	106.4	1550	0.009	0.03	0.75	0.1	3,300
Pt	195.09	1769	0.0045	0.015	0.38	200	25,000,000
Sb	121.75	630.5	0.018	0.06	1.50	3	100,000
Se	78.96	217	0.021	0.064	1.60	8	250,000
Sn	118.69	232	0.015	0.05	1.25	1	25,000
Sr	87.62	769	0.002	0.006	0.15	300	100,000,000
Te	127.60	450	0.15	0.5	12.5	125	500,000
Ti	47.90	1675	0.005	0.016	0.40	0.1	10,000
Tl	204.37	304	0.044	0.133	3.32	35	500,000
V	50.94	1890	0.003	0.01	0.25	2.5	500,000
Y	88.91	1495	0.001	0.003	0.075	0.1	50,000
Zn	65.37	419	0.022	0.066	1.65	0.5	10,000
ZnO	81.37	1970	0.027	0.082	2.05	0.5	10,000

* Value based on a 25-mL sample volume.

** The minimum sampling volume needed to obtain the OSHA PEL at the LOQ for the element/compound at a sample digestion volume of 25 mL.

*** The maximum sampling volume for a given sample, calculated by taking 50,000 µg as the limit for the element/compound per sample.

NOTE: The LOD and LOQ values are dependent on the particular analytical instrument used. Also, LOD and LOQ values may vary for a particular element due to certain interelement interferences.

TABLE 2. EXPOSURE LIMITS, CAS #, RTECS

Element (Symbol)	CAS #	RTECS	Exposure Limits, mg/m³ (Ca = carcinogen) OSHA	NIOSH	ACGIH
Silver (Ag)	7440-22-4	VW3500000	0.01 (dust, fume, metal)	0.01 (metal, soluble)	0.1 (metal) 0.01 (soluble)
Aluminum (Al)	7429-90-5	BD0330000	15 (total dust) 5 (respirable)	10 (total dust) 5 (respirable fume) 2 (salts, alkyls)	10 (dust) 5 (powders, fume) 2 (salts, alkyls)
Arsenic (As)	7440-38-2	CG0525000	varies	C 0.002, Ca	0.01, Ca
Barium (Ba)	7440-39-3	CQ8370000	0.5	0.5	0.5
Beryllium (Be)	7440-41-7	DS1750000	0.002, C 0.005	0.0005, Ca	0.002, Ca
Calcium (Ca)	7440-70-2	--	varies	varies	varies
Cadmium (Cd)	7440-43-9	EU9800000	0.005	lowest feasible, Ca	0.01 (total), Ca 0.002 (respir.), Ca
Cobalt (Co)	7440-48-4	GF8750000	0.1	0.05 (dust, fume)	0.02 (dust, fume)
Chromium (Cr)	7440-47-3	GB4200000	0.5	0.5	0.5
Copper (Cu)	7440-50-8	GL5325000	1 (dust, mists) 0.1 (fume)	1 (dust) 0.1 (fume)	1 (dust, mists) 0.2 (fume)
Iron (Fe)	7439-89-6	NO4565500	10 (dust, fume)	5 (dust, fume)	5 (fume)
Potassium (K)	7440-09-7	TS6460000	--	--	--
Lanthanum	7439-91-0	--	–	–	--
Lithium (Li)	7439-93-2	--	--	--	--
Magnesium (Mg)	7439-95-4	OM2100000	15 (dust) as oxide 5 (respirable)	10 (fume) as oxide	10 (fume) as oxide
Manganese (Mn)	7439-96-5	OO9275000	C 5	1; STEL 3	5 (dust) 1; STEL 3 (fume)
Molybdenum (Mo)	7439-98-7	QA4680000	5 (soluble) 15 (total insoluble)	5 (soluble) 10 (insoluble)	5 (soluble) 10 (insoluble)
Nickel (Ni)	7440-02-0	QR5950000	1	0.015, Ca	0.1 (soluble) 1 (insoluble, metal)
Phosphorus (P)	7723-14-0	TH3500000	0.1	0.1	0.1
Lead (Pb)	7439-92-1	OF7525000	0.05	0.05	0.05
Antimony (Sb)	7440-36-0	CC4025000	0.5	0.5	0.5
Selenium (Se)	7782-49-2	VS7700000	0.2	0.2	0.2
Tin (Sn)	7440-31-5	XP7320000	2	2	2
Strontium (Sr)	7440-24-6	–	–	–	--
Tellurium (Te)	13494-80-9	WY2625000	0.1	0.1	0.1
Titanium (Ti)	7440-32-6	XR1700000	--	--	--
Thallium (Tl)	7440-28-0	XG3425000	0.1 (skin) (soluble)	0.1 (skin) (soluble)	0.1 (skin)
Vanadium (V)	7440-62-2	YW240000	--	C 0.05	--
Tungsten	7440-33-7	–	5	5 10 (STEL)	5 10 (STEL)
Yttrium (Y)	7440-65-5	ZG2980000	1	N/A	1
Zinc (Zn)	7440-66-6	ZG8600000	–	--	--
Zirconium (Zr)	7440-67-7	ZH7070000	5	5, STEL 10	5, STEL 10

TABLE 3: VALIDATION SUMMARY

Analyte	Status[1]	Analyte	Status	Analyte	Status
Ag	Not Valid	CuO	Valid	S	Not Valid
Al	Valid	Fe	Valid	Sb	Partially Valid[4]
Al_2O_3	Not Valid	Fe_2O_3	Valid	Sb_2O_3	Partially Valid[5]
As	Valid	Ga	Valid	Se	Valid
Au	Valid	In	Valid	Si	Not Valid
B	Valid	KCl	Pending	Sn	Partially Valid[6]
Ba	Pending	Mg	Valid	SnO	Pending
BaO	Pending	MgO	Valid	SnO_2	Pending
BaO_2	Pending	Mn	Valid	Sr	Valid
$BaCl_2$	Valid	MnO	Valid	$SrCrO_4$	Valid (by Cr)
$BaSO_4$	Pending	Mo	Valid	Te	Valid
Be	Valid	NaCl	Pending	Ti	Valid
Bi	Partially Valid[2]	Nd	Valid	Tl	Valid
Ca	Valid	Ni	Valid	V	Valid
$CaCO_3$	Valid	P	Valid	V_2O_5	Valid
CaO	Valid	Pb	Partially Valid[3]	Y	Valid
Cd	Valid	$PbCrO_4$	Valid (by Cr)	Zn	Valid
Co	Valid	PbO	Valid	ZnO	Valid
Cr	Valid	Pd	Valid	Zr	Not Valid
Cu	Valid	Pt	Valid	ZrO	Not Valid

[1] Status definitions

Valid: The method is suitable for samples up to at least 0.0500 g bulk material with recoveries of between 90 and 110 percent. This weight exceeds most expected levels encountered in work environments.

Partially Valid: The method is suitable with bulk-material recoveries of between 90 and 110 percent under certain conditions (as footnoted above).

Not Valid: The method procedure is not suitable for samples at any weight with recoveries of between 90 and 110 percent. An alternative method should be used.

[2] Valid up to 10,000 µg/sample and within 7 days of sample digestion.
[3] Valid up to 50,000 µg/sample and at least 24 hours after sample digestion; Valid up to 15,000 µg/sample within 24 hours of sample digestion.
[4] Valid up to 25,000 µg/sample and within 7 days of sample digestion.
[5] Valid up to 25,000 µg/sample and within 7 days of sample digestion.
[6] Valid up to 30,000 µg/sample and within 7 days of sample digestion.

NOTE: The upper limits of the method can be extended by serial dilution of the samples at the time of analyses.